U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 72-97-135

CHICAGO AND NORTH WESTERN RAILWAY DIESEL SHOP
OELWEIN, IOWA
MAY 1974

I. TOXICITY DETERMINATION

It has been determined that employee exposures to a heated caustic mist(i.e. sodium hydroxide) are toxic at the concentrations found during the time of this evaluation (May, October 1973) within the vicinity of the chemical degreasing vat and the adjacent Machinist area of this facility. This exposure has resulted in employee complaints of eye, nose and throat irritation as reported by a majority of the workers in these areas. While such exposures have resulted in the problem of irritant toxicity, it has also been determined that no apparent permanent or acute tissue damage has resulted from this chemical exposure. The latter determination is based on the lack of any demonstrable pathology in the affected structures based on a medical examination of each employee. Environmental concentrations of sodium hydroxide were below the standards for safe exposure, however, the current standards do not address the question of a safe exposure to a heated caustic mist. It has been pointed out in the context of the full report that organic solvent vapors are not felt to have caused any significant health disability during the investigation. Nonetheless, improper handling of these solvents may have resulted in skin eruptions among exposed employees and in the absence of appropriate ventilation, these compounds may contribute to the overall problem of irritant toxicity as described above.

In order to ameliorate the existing hazard(s), recommendations addressing the exhaust system for the chemical vat, interim precautionary measures, a protective gear program, proper handling of organic compounds, noise abatement and safety awareness have been suggested for consideration by the management of this facility.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

a) Chicago and North Western Transportation Company, Oelwein, Iowa
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region VII
d) State of Iowa Department of Labor - OSHA
e) NIOSH - Region VII

For the purposes of informing the approximately 20 "affected employees," the employer will promptly "post" the Determination Report in a prominent place(s) near where affected employees work for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding personnel exposure to vapors from a chemical degreasing vat in the Machinist Area of the Oelwein Diesel Repair Shop, Chicago and North Western Railway, Oelwein, Iowa. This request was precipitated by the hospitalization of two employees for conditions which suggested the presence of a job site hazard and prompted other workers to question their own health and safety in such an industrial environment.

IV. HEALTH HAZARD EVALUATION

A. Description of Process-Conditions of Use and Conditions Which Prompted Request

Overall operations at the Oelwein facility involve the complete repair and rebuilding of locomotive (diesel) engines and cars. In general, the Back Shop serves as a larger two-story "hanger" or "garage" where the diesel is dismantled, cleaned and rebuilt. Operations covered by the request concern the receipt, cleaning, dismantling, machining, testing, and rebuilding of various locomotive engine parts (e.g., pistons, valves, etc.) which are coated with carbonaccous materials. These operations are conducted in an area of approximately 4700 square feet which includes a mezzanine of about 700 square feet on the back wall. Within the confines of this area and contiguous with the North Wall is an 11 x 11 x 3 foot chemical vat containing a caustic solution which is maintained at approximately 200°F using steam bubbling through the solution. The vat contains a chemical called SECO 75 or TYSOL 810 which consists of primarily sodium hydroxide (caustic), with a chelating agent, and a wetting agent. The parts are placed in the vat for about 4 hours and then removed for steam cleaning.

The original Hazard Evaluation Request addressed the question of toxicity from the mists and fumes generated during the vat operations. However, an evaluation of conditions in the adjacent area was included as part of the Request due to the fact that the mists and/or fumes were observed to spread into that area when the vat cover was off during removal of parts from the vat (the vat did not have a cover prior to the Request). Operations adjacent to the vat area appeared to be of secondary concern from the standpoint of the process evaluation. The operations included various machining (e.g., honing, valve grinding, etc.) and testing processes. The machining processes utilized ENSIS 254 oil and Stoddard Solvent; and the testing processes utilized Stoddard Solvent, Zyglo and Magna-flux solutions. These latter operations give rise to some organic vapors such as Stoddard Solvent and other minor contaminants which are contained either in the oils or solutions. The Vat Operator and the Water Test Operator work in the immediate vicinity of the "Caustic Vat" during the day shift (1st shift) and a Vat Operator is also employed on swing shift (2nd shift) as well as two other machinists in adjacent Machining and Test areas (75% of total area evaluated). In all, there are about 11 employees (e.g., machinists and helpers) engaged in the Machining and Test operations. In most cases, the primary complaint appeared to be related to the mists and vapors generated by the "Caustic Vat."

Regarding the medical circumstances surrounding this investigation, on September 7, 1972, two of the employees working in proximity to the "Caustic Vat" informed their supervisor that they had been experiencing an irritating dryness of the nose and throat and frequent chest pains associated with shortness of breath. They were advised to go to their local physician. It was learned that these men, as well as many other machinists and both chemical vat operators in the facility were experiencing similar, albeit less pronounced symptoms. The physician who saw the ill men ordered chest x-rays and told one of the men that certain changes on the film necessitated treatment with an antibiotic drug. The physician permitted both men to return to work following a successful convalescence.

On September 14, 1972, a similar incident occurred with the vat operator on the second shift who experienced nausea and vomiting in addition to the symptoms described above. This individual was hospitalized for a suspected pneumonia as diagnosed on chest x-ray. After six days of antibiotic therapy the patient's x-ray had shown improvement and the patient was discharged from

the hospital. The physician requested the removal of the latter worker to a different area of the plant. This was done and it was accompanied by a complete cessation of the symptoms. The other two men involved in the earlier incident remained in the same area and continued to experience intermittent irritation of those noses and throats.

B. Evaluation Design

Following a preliminary observational survey which facilitated recognition of the most probable health hazard (December 19, 1972), it was necessary to return to the facility to conduct more in-depth evaluations of employee exposures to a caustic mist generated in the Vat and Machinist/Test Areas. The first follow-up survey (May 16-17, 1973) revealed that a high percentage of the employees in the area had symptoms consistent with an exposure to sodium hydroxide mist, although environmental levels were low. A second follow-up survey was made on September 4, 1973 to determine if the best sampling and analytical techniques for caustic mists and fumes were being employed. Finally, to determine whether there were any significant pathologic changes in the upper respiratory structures of exposed employees, another visit (October 25, 1973) was made to examine all potentially exposed workers and to conduct a second complete environmental survey. On the latter occasion, a qualified otolaryngologist (i.e., Ears, Nose, and Throat specialist) from the University of Iowa Medical Center was employed to perform the medical examinations.

A summary of the procedures used to assess the validity of the alleged hazard included: on-site interviews with representatives of union and management; a walk-through inspection of the work place; collection of bulk samples for analysis and identification; administration of medical questionnaires to all workers potentially exposed to plant contaminants, as well as to a group of workers from another area without significant chemical exposures; a medical examination of all workers participating in the study; and extensive air sampling to detect potentially toxic agents in the workroom atmosphere.

C. Evaluation Methods

1. Environmental

Employee exposures to organic vapors were measured with personal air sampling equipment. Breathing zone air samples were obtained using charcoal air sampling tubes. The charcoal tubes were sent to NIOSH Laboratories in Salt Lake City and were analyzed by the gas chromatographic method reported by W.D. White, et. al.[1]

Employee exposures to sodium hydroxide mists or fumes were measured with personal air sampling equipment. Breathing zone samples were obtained using cellulose membrane filters [AA] (esters of 37 millimeters diameter) or impinger samples using .01 Normal solution of sulfuric acid, either of which is an acceptable method. The samples were sent to the NIOSH Laboratories in Salt Lake City and analyzed by standard sodium ion probe or atomic absorption methods. Samples for sulfuric acid were obtained with impingers using .01 Normal sodium hydroxide solution as the collection medium and analyzed by standard titrimetric techniques.

Regarding personal air samples, a sampler was attached to an employee's collar or lapel and connected via Tygon Tubing to an "MSA Model G, Battery G-Powered Vacuum Pump." This apparatus was then attached by a belt at the employee's waist. The general area samples were collected in specific locations in the working environment. Indicator tube samples (e.g., carbon monoxide, acrolein, etc.) were obtained in accordance with the routine instructions for a MSA Universal Test Kit to assess the presence or absence of specific contaminants which were not considered to present a significant hazard in this plant. In addition, a Wilks Portable Infrared Spectrophotometer was used to scan the spectrum for airborne contaminants which might have been significant.

2. Medical

A total of fifteen workers employed in the vicinity of the chemical degreasing vat agreed to participate in the study. In addition, ten workers from another area of the plant were randomly chosen to serve as a control population. Prior to the start of the work shift on the final day of the investigation each worker was individually administered a questionnaire by a NIOSH Medical Officer. Sex, age, race, and length of employment at the plant were recorded, as well as a complete occupational history. A brief past medical history was basically confined to the ears, nose, throat, cutaneous and nervous systems. Regarding symptomatology, each worker was requested to indicate the presence or absence of several specific symptoms on the day of the study. To obtain a record of the latter, the worker was given a record sheet listing burning or redness of the eyes, burning or dryness of the nose, burning or dryness of the throat, burning of the chest, headaches, rhinorrhea, sneezing, wheezing, skin rash, and nosebleed. The workers was instructed to circle the symptom if it appeared during the day and note the time the symptom occurred by writing it down in the space provided next to that symptom.

Each worker received a physical examination of the skin and upper respiratory tract structures. All findings were recorded by the examining physician. Following this examination, the worker reported to his work station and at the close of the work shift he returned for a second examination. Symptom record sheets were collected prior to the worker's departure from the plant.

Furthermore, a review of the physician summaries and chest x-rays regarding the employees that had been ill before this investigation was kindly provided by the local physician who had cared for the hospitalized men. The medical records and chest x-rays were studied and judged independently by three NIOSH Staff Physicians and x-rays only were also read by Staff Radiologists at the University of Cincinnati Medical Center.

D. Evaluation Criteria

1. Environmental Standards

The Occupational Health Standards promulgated by the U.S. Department of Labor (Federal Register, October 18, 1972, Title 29, Chapter XVII, Subpart G, Tables G-1, G-2) applicable to the primary individual substances considered in this evaluation are as follows:

Substance	8-Hour Time Weighted Average	Acceptable Ceiling Concentration	Acceptable Maximum Peak Above The Acceptable Ceiling Concentration For An 8-Hour Shift	
			Concentration	Maximum Duration
Benzene	30 mg/m^3*	80 mg/m^3	160 mg/m^3	10 minutes
n-Butyl Acetate	710 mg/m^3	-	-	-
Stoddard Solvent	2950 mg/m^3	-	-	-
Sodium Hydroxide	2 mg/m^3	-	-	-
Sulfuric Acid	1 mg/m^3	-	-	-

*Approximate milligrams of particulate per cubic meter of air.

2. Biological Standards

The biological criteria used to determine a toxic response to the substances under investigation consisted of the subjective information reported by each worker and those abnormalities as detected in the mucosa of the upper respiratory tract, eyes and skin which might reasonably ensue from an occupational exposure to noxious agents (as observed during the medical examinations).

E. Environmental and Medical Results and Conclusions

1. Environmental Results

Sodium Hydroxide, Sodium Compounds, and Sulfuric Acid

Both "SECO 75" (trade name) and TYSOL 810 (trade name - vat solution 10/25/73) have been used in the "Caustic Vat" as the cleaning agent during this evaluation. Both compounds contain more than fifty percent sodium hydroxide with

the remaining components primarily consisting of sodium compounds (e.g. sodium gluconate, tetrasodiumpyrophosphate), and minor amounts of non-sodium compounds. In this regard, total sodium was obtained from analysis and is reported as sodium hydroxide.

The results of three sampling methods, employing impingers, vinyl metracel and "AA" filters, were shown to be comparable as used in this evaluation for the assessment of sodium hydroxide in the atmosphere. There were a total of 13 personal and 12 general area air samples obtained and analyzed for sodium hydroxide during the three days (5/16-17 and 10/25/73) covered by this evaluation. Personal air sample results ranged from a time-weighted average (TWA) exposure of 0.01 to 0.2 mg/m^3 with an average of 0.1 mg/m^3 sodium hydroxide. General area air samples varied from a TWA exposure of 0.01 - 0.7 mg/m^3 with an average of 0.15 mg/m^3 sodium hydroxide. These levels were less than ten percent of the current Standard of 2 $mg//m^3$ for this compound. Eight sequential general area samples were also obtained on one of the swing shifts in the vicinity of the vat and these varied from 0.1 to 0.3 mg/m^3 sodium hydroxide.

The vat solution is changed every four to six weeks by neutralizing with sulfuric acid and the exhausted solution is subsequently transferred to the Waste Treatment Plant prior to discharge as sewage. The solid SECO 75 or TYSOL 810 is then added to the vat with water and heated via steam. There were three personal samples and three general area air samples obtained and analyzed for sulfuric acid during one vat change operation. The results ranged from a TWA exposure of 0.1 to 0.6 mg/m^3 with an average of 0.3 mg/m^3 sulfuric acid. The results were less than sixty percent of the current Standard of 1 mg/m^3 for sulfuric acid. During vat change operations the results for sodium hydroxide varied from a TWA exposure of 0.1 to 0.3 mg/m^3 and were similar to those for normal operations involving the "Caustic Vat." General Area Air Samples were also obtained in the control area (i.e. away from the area being evaluated) for sodium hydroxide and were all less than one-twentieth of the health standard.

Stoddard Solvent and Organic Compounds

The results of analysis of the charcoal tubes and bulk samples showed that Stoddard Solvent was the primary consideration in the evaluation of the workers' exposure to organic fumes. Although samples were obtained on 10/25/73, the results for Stoddard Solvent were so low due to the limited activity involving organic compounds that the results are not included in this report. There were 13 personal air samples and 18 general area air samples analyzed on the later dates with results with results showing levels for Stoddard Solvent varying from 13 to 780 mg/m^3 during normal operations. In considering the time involved for these operations and other considerations, it is estimated that the average TWA exposure for these machinists

is approximately ten percent of the current standard for Stoddard Solvent with a maximum TWA exposure of around twenty percent of the standard. This estimate is based on employees working in or near the vicinity of containers filled with organic compounds for two hours and on visual observations and questioning of employees at the time of the survey. Hence, the estimate could increase significantly if an employee were to spend excessive periods of time cleaning (eg. with Stoddard Solvent) or coating (eg., with ENSIS oil, etc.), or conducting test operations (eg., with Magnaflux) or if the throughput of parts in a unit of time is significantly increased over that observed at the time of the survey. It is further noted that there were no other significant peaks of organic compounds reported in the analytical results although benzene and butyl acetate were detected in some samples. The results for benzene and butyl acetate were significantly less than one-twentieth of the permissible TWA exposures for these compounds. General area air samples were also obtained in the control areas (away from area being evaluated) for Stoddard Solvent and other organic compounds, and the results were similar.

Other Considerations

The pH of the vat solution was found to range between 12.5 and 13.5 using a sensitive pH paper at various times during the survey. The foam on top of the vat solution was found to be around a pH 12.5 with the condensate on the outside of the vat around a pH of 8.

The locomotive engines were started and run for periods of time in other areas of the shop. Hence, a Drager test and/or MSA Universal test kit was employed to determine levels of carbon monoxide, oxides of nitrogen, nitrogen dioxide, formaldehyde, and acetaldehyde at various times during the survey. The results were sufficiently low that a more in-depth evaluation was not felt to be necessary for these compounds.

2. Medical Results

Medical Questionnaire

Of the 15 workers in the exposure group, all were male caucasians with a mean age of 42 years old (range 21 - 63). All 10 workers in the control population were also male caucasians with a mean age of 38 years old (range 24 - 59). Employees in both groups indicated that they enjoyed good general health. There were no atopic individuals in the work force. Occupational histories did not reveal anything in the workers' pasts that might have a bearing on the study. All workers who participated in the study had been employed in the Diesel Shop for at least 16 months.

The results of the questionnaire data relating to symptomatology (i.e. the occurrence of any given symptom at a minimum frequency of four times per year

while on the job) may be found in Table I. The most frequently reported symptoms were those of irritation of the upper respiratory tract and the eyes. The above data relates strictly to the exposed group of workers, whereas, all workers in the control group were completely asymptomatic.

Symptom Record Sheets and Medical Examinations

The symptoms logged by the workers on the day of the investigation also related to irritation of the upper respiratory tract. The temporal occurrence of the symptoms is shown in Table II. While the employees reported the onset or exacerbation of a given symptom frequently during a period when the chemical degreasing vat cover had been removed, the incidence of symptoms was similar during periods when the vat cover was in place.

The results of pre-work and post-work nose and throat examinations did not reveal any significant pathology in either the exposed or the control worker groups. Many of the workers in both groups were noted to have injected conjunctivae at the start of the work shift but this finding did not appear to change during the course of the day. None of the employees demonstrated skin eruptions related to in-plant factors.

It might be mentioned at this point that all NIOSH physicians, as well as the University radiologists who reviewed the medical records and chest x-rays of previously ill workers concluded that a diagnosis of chemical bronchitis would be consistent with the findings that were available.

3. Discussion

The results of the medical survey at this facility indicate that the majority of workers in the exposed group are experiencing irritation of the upper respiratory tract and the eyes. The lack of symptomatology in the control group suggests that environmental factors peculiar to the Machinist Area of the plant have caused the workers in this area some measure of subjective disability. Notwithstanding the problem of irritation among exposed workers, it has been shown that no apparent chronic tissue damage to the upper respiratory tract or eyes has resulted from such chemical exposure. Furthermore, no acute tissue response would be demonstrated during the post-work physical examination of the workers.

In that environmental factors in the Machinist Area are felt to be responsible for the occurrence of symptoms among the workers, the type of complaints reported by the workers suggest that heated caustic mist generated by the degreasing vat may be responsible for the irritation phenomena. It is clear that the majority of workers experience problems when the vat cover is off, permitting the mist to billow into the Machinist Area. However, in order to explain why symptoms are reported as frequently when the vat cover is in place,

it is necessary to re-examine the exhaust system for the vat. This system was observed to discharge the mist (when the vat cover was in place only) through a port in the wall which was only six feet from the ground. Almost directly contiguous to this exhaust port is a door which is opened and closed very often during the work shift and on occasion (particularly in the warmer seasons) it is left open for ventilation. When the door is open the negative in-plant pressure creates a cross-circuiting of the exhaust, recirculating contaminants into the Machinist Area.

Unfortunately, the exhaust "cross-circuit" was noted after the actual time period of the investigation and therefore the exact times that the door was open during the work shift were not systematically recorded.

It is further noted that the majority of the other vats containing organic compounds did not contain a tight fitting lid when they were not in use. Additionally, the Magnaflux operation appeared to maximize the exposure of the employee operator where there was little or no ventilation provided inside the enclosure.

It has been pointed out in the literature that airborne contact with sodium hydroxide is particularly irritating to the eyes and the mucous membranes of the upper respiratory tract.[2,3] Certainly, the situation in this plant has led to the threat of a serious environmental hazard at various times prior to our investigation which caused the hospitalization of one employee and the need for two other employees to seek the care of a physician. The diagnoses of chemical bronchitis in all three cases leaves little doubt as the etiology of the condition, particularly in recalling that the men became ill at a time when the chemical vat had no exhaust system whatsoever. The precise role that the heating of the caustic mist has played can not be stated with any surety, however, Sax[3] makes specific note of the fact that steam will react with sodium hydroxide to potentiate the danger of contact with living tissues.

The environmental concentration of organic vapor contaminants are all quite low and at such levels one would not expect any significant effects to the workers. The lack of neurologic symptomatology among the workers tends to support this line of reasoning. Nonetheless, it is quite possible that reported skin eruptions in the past have been caused by needless skin contact with these liquids by the workers who for the most part have not been supplied with adequate skin protection.

In summary, the results of the medical survey at the Oelwein Diesel Shop suggest that there is a potential hazard of caustic mist exposure to all workers in the Machinist Area of the plant. It has been determined that exposure to this caustic mist is toxic to the eyes and structures of the upper respiratory tract. This determination is based on the finding that a majority of the employees in the area developed symptoms of upper respiratory tract and eye irritation during the study, however, it was also determined

that no apparent permanent or acute tissue damage has resulted from such chemical exposure. The latter determination is based on the lack of any demonstrable pathology in affected structures following an examination of each employee in the Machinist Area. Environmental concentrations of sodium hydroxide were below the Standards for safe use, however, the current Standard does not address the safe expsoure to a heated caustic mist. It has been pointed out that organic solvent vapors are not believed to have caused any significant disability, however, improper handling of these solvents may have resulted in skin eruptions among exposed employees and in the absence of appropriate ventilation, these compounds may be contributing to the overall problem of toxicity.

In order to ameliorate the existing hazard(s), recommendations addressing the exhaust system for the chemical vat, interim precautionary measures, a protective gear program, proper handling of organic compounds, noise abatement and safety have been made to the management in the form of a letter which may be found in Section VIII - Appendix. The usefulness and proper application of an Occupational Health Program should be considered by the management. A complete review of the subject of the In-Plant Occupational Health Program has been reviewed elsewhere by Cohen.[4]

V. REFERENCES

1. White, WD et al: A Convenient Optimized Method for the Analysis of Selected Solvent Vapors in the Industrial Atmosphere, Am. Ind. Hyg. Assoc. J, 31:225 (1970).

2. Patty, FA: Industrial Hygiene and Toxicology, V II, 2nd ed, pp 859,1201, Interscience, New York, 1963.

3. Sax, NI: Dangerous Properties of Industrial Materials, 3rd ed, pp 1106-1129, Van Nostrand Reingold, New York, 1963.

4. Cohen, SR: Another Look at the In-Plant Occupational Health Program, J. Occupat Med, 15:869 (1973).

VI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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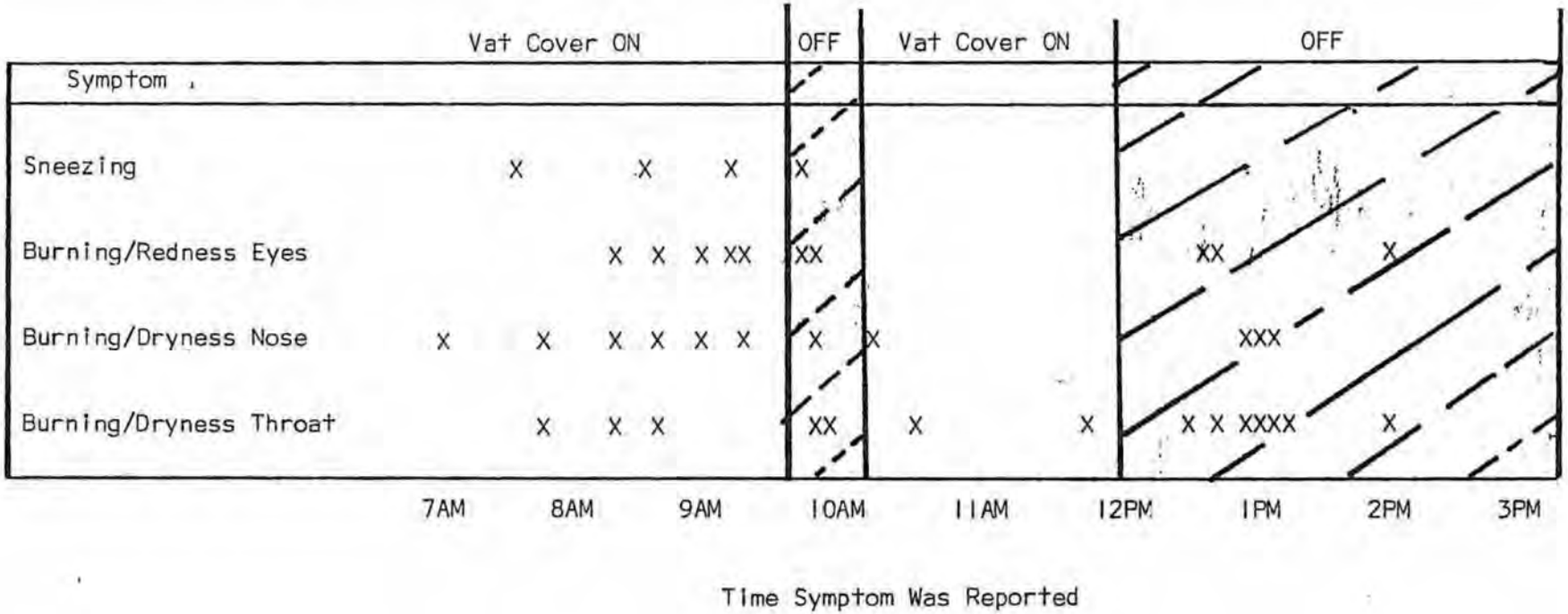
TABLE I

SYMPTOMS REPORTED BY 15 MACHINISTS EMPLOYED IN A DIESEL REPAIR SHOP

Symptom	Total # Workers Reporting Symptom(%)
Burning/Redness Eyes	8 (53)
Burning/Dryness Nose	9 (60)
Burning/Dryness Throat	7 (44)
Burning in Chest	2 (13)
Headache	1 (7)
Rhinorrhea	1 (7)
Sneezing	0 (0)
Wheezing	0 (0)
Skin Eruption	3 (20)

TABLE II

TEMPORAL OCCURRENCE OF SYMPTOMS REPORTED BY 15 MACHINISTS IN A DIESEL REPAIR SHOP DURING A NORMAL WORK SHIFT



VIII APPENDIX

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

October 31, 1973.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

***
Assistant Division Manager - Mechanical
Missouri Division
Chicago and North Western Transportation Company
Oelwein, Iowa 50662

Dear ***

At the request of *** Medical Director, Chicago and North Western Transportation Company, the following recommendations are being provided for your information until the "Final Report" regarding the Health Hazard Evaluation conducted at your facility is completed. All recommendations are subject to modification in the Final Report, however, we do not expect any major changes.

(1) Alkali Degreasing Vat

An assessment of employee exposures to a caustic alkali mist, generated during the degreasing operation, has not revealed environmental air concentrations of sodium hydroxide above the Federal Standard. Nonetheless, the present method of controling the escape of such mists into the plant environment is not considered to be good industrial hygiene practice. Furthermore, a considerable number of workers in the vicinity of this vat have complained of eye, nose and throat irritation. Fortunately, nose and throat examinations received by each worker in the area did not show any acute or chronic damage resulting from caustic mist exposure. However, in our best judgement it would be prudent to provide for the adequate removal of the mist being generated during the degreasing process in order to preclude any possibility of developing transient or prolonged irritating exposures to the workers in the vicinity of the vat. Therefore, the following measures are suggested:

(a) The ventilation system for the alkali degreasing vat should be improved with either an effective slot exhaust system or other similar control measure(eg. push-pull system, etc.). Additionally, the outflow stack for this system should provide for the discharge of contaminants at the roof level in order to prevent the re-entry of pollutants into the plant work areas. Specific criteria for the ventilation of open surface tanks is provided in the Federal Register, October 18, 1972, Title 29, Chapter XVII, Section 1910.94, pp. 22154-57. Criteria has also been published by the American National Standard Institute(ANSI) and the American Conference of Governmental Industrial Hygienists(ACGIH).

***Personal/confidential information has been deleted where asterisks are present.

(b) Until item 1(a) can be implemented, a respiratory protective program should be established for the vat operator, his helper, and the water-test operator. This program may be styled after the suggested guidelines offered in the "Respiratory Protective Devices Manual" published jointly by the American Industrial Hygiene Association(AIHA) and the ACGIH.

(c) Chemical goggles, safety boots, aprons and neoprene gloves should be provided to the vat operator and all other workers involved with the changing of the alkali solution in the degreasing vat.

(2). Use of Organic Compounds

Although neither the environmental nor the medical aspects of this investigation documented ambient levels of organic compounds in excess of the Federal Standards, again, there were a number of poor industrial hygiene practices observed regarding the use of these compounds. The following recommendations are offered to provide for a better working environment and to preclude any unnecessary exposures to organic compounds as used in this facility:

(a) The "magnaflux" operation involving the use of organic solvents should be provided with effective slot ventilation or another suitable system to assure that the flow of contaminants is away from the operator and other workers in the area of this process. Similar suggestions for ventilation improvements would apply to the Zyglo operation, however, this process was not observed in sufficient detail during the visit to recommend the type of ventilation system that might be applicable.

(b) Tight fitting covers should be provided for those solvent containers used in the head liner and machining operations to prevent the escape of organic vapors into the workroom atmosphere when the containers are not in use. More stringent controls, such as prohibition of smoking and specific safety containers, may be necessary in areas where the possibility of a fire or explosion hazard exists in connection with the use of certain solvents. This latter aspect should be thoroughly evaluated by the Corporate Manager of Safety.

(c) Chemical goggles and neoprene gloves should be provided to all workers during operations involving the use of these organic compounds.

(3) Noise

Noise measurements taken during this investigation indicate that there is a need for a noise conservation program. Operations where excessive noise levels were detected include the head gang(hammering and seating valves), liner gang(honing of pistons), sand blasting(motor of sand blasting machine using "walnut shells") and valve grinding. Therefore, a comprehensive noise

survey of the facility is recommended. Attention should be directed towards engineering out noise problems, conducting audiometric examinations where necessary and, perhaps, starting a hearing protection program if ultimately needed.

(4) Safety

The current "safety" program at this facility is judged to be inadequate. The workers in the facility were noted to be poorly informed about the potential health and safety hazards found in the plant. General housekeeping could be markedly improved with particular attention paid to removing all tripping hazards, adequately shoring all of the loose compressed gas cylinders in the plant and providing a guard for the ladder going to the overhead crane.

***

Information concerning commercially available vats and degreasers has also been supplied to the management. Should any questions arise concerning any of these recommendations please do not hesitate to call upon us.

Sincerely,

Steven R. Cohen, M.D.
Medical Officer
Medical Services Branch

cc: ***

Addendum: A copy of this correspondence has been sent to *** authorized representative for labor at this plant.